

OFFICIAL JOURNAL OF
THE MUSHROOM GROWERS'
ASSOCIATION

MGA

BULLETIN

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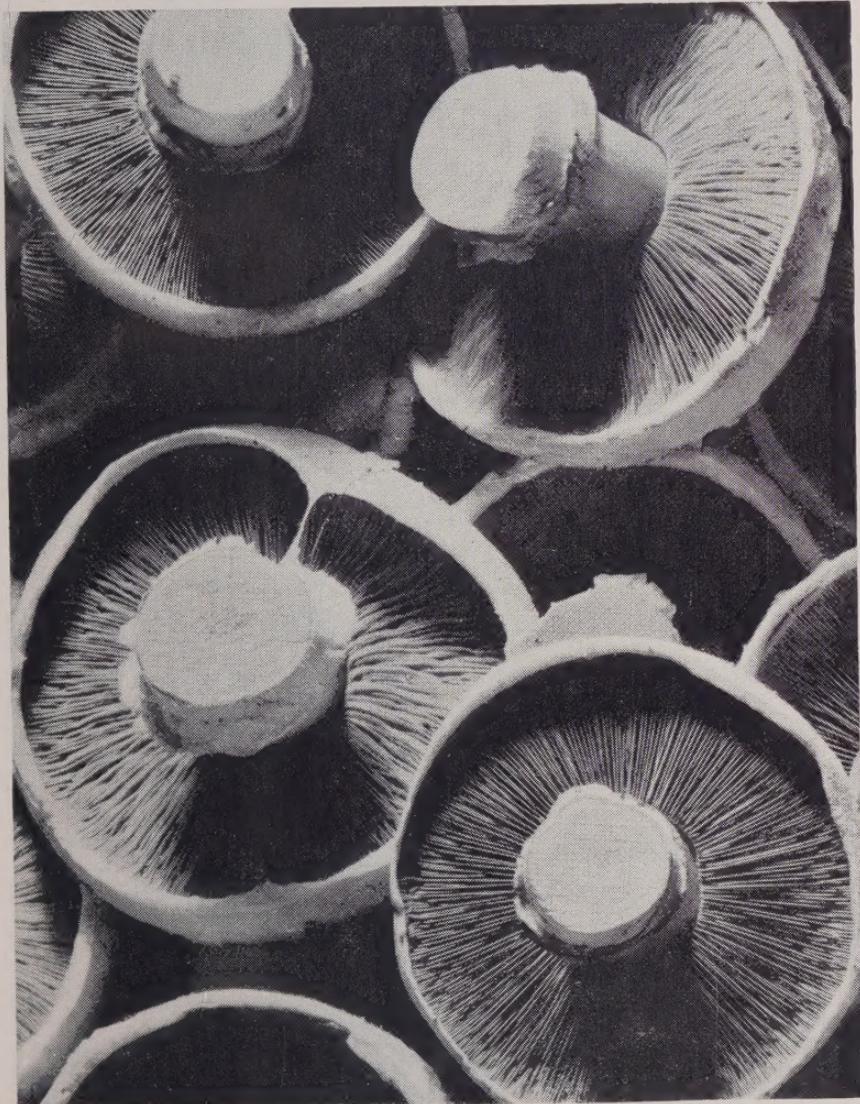
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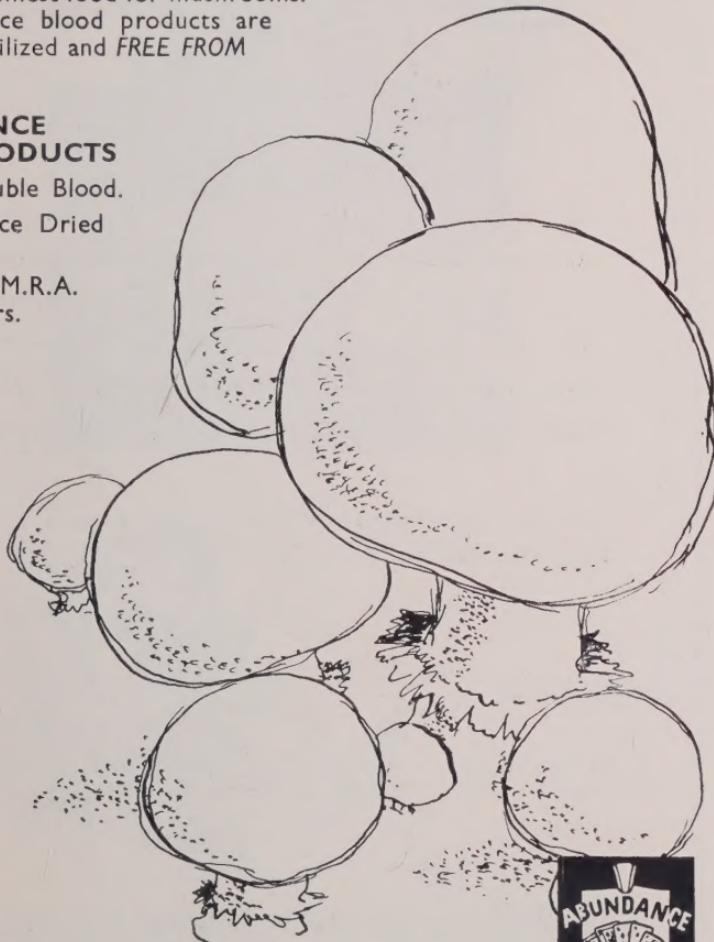
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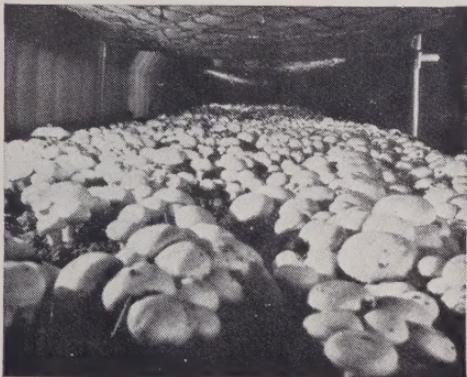
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NUMBER 40

MGA BULLETIN

EDITORIAL

THE FUTURE of YAXLEY

GENERAL SIR OLIVER LEENE is a Director of the Mushroom Research Association. It is most fortunate for the Mushroom Industry that some months ago he agreed to represent the Board in its negotiations with the Ministry of Agriculture over the financial responsibility for the maintenance of mushroom research after 1953. At the invitation of the Editor, Sir Oliver adds the following footnote to the appeal letter which went out to the Industry a month ago.



I welcome this opportunity to tell you that the negotiations with the Ministry of Agriculture, on the transfer of the Mushroom Research Station to the Government Glasshouse Research Station which is to be set up at Toddington in Sussex, are going slowly but well. Our main difficulty lies in the fact that the Governing Body of the new Station is not likely to be legally constituted till late in 1953; and until this is done, we cannot hope for any definite information as to our future.

On the asset side, I can assure you that I have found the greatest sympathy and interest towards further research in mushroom culture both in the Agriculture Research Council and in the Ministry; and I am hopeful that we shall achieve a satisfactory solution to our problems before the end of the year. It is dangerous, however, to prejudge any issue, but I feel that I have good reason to be optimistic that this will be the last time that we have to make an appeal to the Industry to keep our Research Station in being. If this is so, I hope that next year we may all of us have the opportunity to subscribe some small amount, to enable us to maintain both an individual and a collective interest in the further development of our Research problems.

Finally I say to each one of you: An immense amount of Research—in fact a complete Revolution in the technique of Mushroom growing—has taken place in the last few years as a result of the endeavours of Research workers in this country and overseas: but even so I believe we have a very long row to hoe before our knowledge of the culture of our particular commodity is anything like as good as that of Agriculture and Horticulture generally.

And it is in this spirit of urgency to improve our knowledge that I submit to you that it is up to each one of us relentlessly to pursue our aim—*To press on with the many Research problems that lie ahead of us; and by doing so to gain the information and experience necessary to improve our methods and our yields.* By this means only, can growers large and small survive and sometimes flourish!

REFRESHER COURSE, 16th APRIL

A sketch was reproduced in one of our newspapers recently from the French *La Presse*. A late arrival at a conference was told at the door that the programme had started, so would he please make as little noise as possible. "Are they asleep already?" asked the delegate.

You are not likely to fall asleep in Peterborough's Town Hall, on 16th April, but you will be made as comfortable as possible.

Unfortunately Mr. A. D. Harrison will be unable to attend and give his paper on zineb. However, we are pleased to be able to announce that **Mr. Stanley Middlebrook** has consented to discuss **The Tray System**. Have you made *your* reservation ?

GEMBLOUX CONFERENCE

Members wishing to attend the Second International Conference on Mushroom Science, from 16th to 23rd June, should write at once to the Conference Secretary, Mademoiselle L. Engels, Institut Agronomique de l'Etat, Gembloux, Belgium. (Postage for an ordinary letter is 4d., by the way.) The Editor would be interested to have their names. The fee for the course is only 100 francs (about 14/-).

It is estimated that from the afternoon of 15th June, until the afternoon of 20th June, the charge for hotel accommodation, transport between Brussels and Gembloux, and the closing Banquet, will be about £15 per head. From the afternoon of 20th June, to the afternoon of 24th June, the charge will be about £12 10s. Od., again including hotel and travelling expenses to and from Brussels, Holland (Maastricht-Wageningen), and possibly Ostend. Once in Brussels, these charges will be inclusive—except for drinks; these can never be estimated, for the capacity of individual growers varies between normal and fantastic.

The amount of currency permitted abroad has not yet been announced, but the Conference would rank for a "business allowance."

WORTHING AND WEST SUSSEX GROWERS

Mr. Arthur DeB. Hovell, former Chairman of the MGA, was re-elected Chairman of the Worthing and West Sussex Growers at their Annual Meeting, with **Mr. S. W. Parker** again Vice-Chairman.

Mr. Hovell presided over the annual dinner in Worthing on 6th March. His health was warmly proposed by **Mr. Parker**, who said they were very fortunate in having Mr. Hovell as their Chairman for the fifth successive year. "He is forthright—sometimes very forthright—but his forthrightness is always tempered with patience and tact" (applause). In reply Mr. Hovell paid tribute to the great help he received from Mr. Sid Parker and went on to tell several of his inimitable stories.

Mr. Harold G. Boxall, MGA Chairman, welcomed the Ladies and other Guests. This toast was replied to by **Mr. Fred. C. Atkins**, MRA Chairman, who expressed the hope that, with the Worthing and West Sussex Growers' and the Mushroom Growers Association's Chairmen such good friends and neighbours, the two organisations would in future work more closely together, to their mutual benefit.

The remainder of a delightful evening was spent in dancing.

DRY ICE and PRE-PACKAGING

The MGA Library has just received a copy of a report by a team of British horticulturists who visited the United States in 1951 to study *Fruit and Vegetable Storage and Pre-Packaging* (the title of their 3/- publication).

Ordinary ice being obviously unsuitable for packing with mushrooms, the Americans for long journeys are using "dry ice" (solid carbon dioxide). The Report says:

"For this purpose a block of 5 to 6 lb., wrapped to prevent freezing of produce near it, was placed in the centre of a master container holding forty $\frac{1}{2}$ lb. cartons of mushrooms. The space left in the centre of the container was lined with corrugated cardboard and it was found by the firm employing this method that the quantity of dry ice used was enough to ensure the mushrooms reaching their destination in good condition after a journey of two days."

The mushrooms are kept cool, which is a good thing at any time and essential in trans-continental travel in the States in warm weather. The possibility is mentioned of the carbon dioxide which evolves being an additional aid to preservation.

It would be interesting if someone would do a little research into this packing with dry ice; is our Research Station too busy? It need not absorb much time.

Research which is even less within the province of the MRA is also needed in pre-packaging, i.e., the presentation of produce to the shopper in individually-prepared units of sale. Some of us have packed in 1 lb. cartons for years, and a few growers have been trying $\frac{1}{2}$ lb. punnets with apparent success, but we are far behind the Americans here.

The Report states: "To-day (in the States) probably 50 per cent. of total retail sales by weight are in these packages. Cardboard cartons or boxes are used, some having transparent film windows or simply cut-out windows. Some boxes may be completely closed. The Team visited only one mushroom plant, but it seems obvious that packaging of this crop should be done at the production point Some packers are now printing recipes on the boxes. At the one mushroom plant which the Team visited in Michigan, mushrooms are sorted into two quality grades under the firm's own marks.

"Top-quality produce only should be pre-packaged, and distributors should ensure that it is not offered for sale as pre-packaged produce if held so long that it loses its condition.

"There should be more research in the effects of different films and other packing materials on particular products.

"The possibilities of the market for pre-packaged fresh fruits and vegetables and the economies of pre-packaging should be investigated, possibly by the appropriate branches of the Ministry of Agriculture."

Perhaps we should give these matters closer attention, with the price level again falling.

F.C.A.

OUR CUSTOMER THE HOUSEWIFE

H. R. Haynes on the Show Society

A few years ago, in 1947 to be exact, a group of growers decided that it was time that the horticultural industry set up its own organisation to promote better growing, grading and presentation of its produce, and the publicising of the industry to the general public throughout the country.

In considering the scope for development in the field of technical advancement and publicity which was open to the industry this small group of growers sadly reflected on what had been, and was being, done in the countries overseas which look to our Island as an export market for horticultural produce.

In 1948 the plunge was taken, and the NFU Market Produce Show Society emerged, which included among its objects the two questions referred to above.

As a start, the Society took over the organisation of the Hampshire Horticultural Show which had, since 1946, been held at Southampton, and in addition it undertook the staging of the two displays of horticultural produce exhibited at Chelsea and at Southport.

By means of the National Show, which this year is to be held in conjunction with the Royal Show at Blackpool, growers are enabled to see how their fellow growers in all parts of the country pack and grade their produce for market, and in the last six years a highly competitive spirit has developed among County Branches struggling for pride of place in the contests open to NFU Branches. Growers visiting this Show also have the opportunity of seeing demonstrated all the latest horticultural machinery and appliances and the modern requisites so necessary in the conduct of an up-to-date horticultural holding. The N.A.A.S. has also played its part at the Show and growers have the opportunity of discussing with leading experts the latest scientific developments.

At Chelsea and at Southport the Society has been able to display home-grown horticultural produce to a vast cross-section of the general public who attend these Shows. These exhibits have been authoritatively described as "the shop window of British Horticulture" providing, as they do, a glimpse of what our industry can do if given the opportunity.

The Mushroom Growers' Association has always been alive to the need for taking advantage of the benefits of technical advancement and the value of well-directed publicity. With the help of the Association, mushrooms have always prominently featured in the Society's displays at Chelsea and at Southport. The M.G.A. also played its part at the great National Show at Olympia, and organised an exhibit which reflected great credit on this specialised section of our industry.

Over the last eighteen months the Society has gone a stage further in putting over horticulture's message direct to the housewife—our customer—and arrangements have been made with large stores throughout the country to organise "Weeks" when concentrated publicity has been given to one or other of the horticultural subjects.

We, in the Show Society, would be pleased to give any help we can to the MGA in the organising of a "Mushroom Week" in Harrogate, for example, during your Annual Meeting and Exhibition. This could be the beginning of a really first-class publicity campaign for the industry.

From this small but very real effort to extol the virtues of the mushroom something much greater could develop! It all rests with the industry itself. **By supporting your Association, and the Society, great strides can be made in bringing home forcibly to the general public the important contribution which the mushroom industry can make to the diet of people in this country.**

CORRESPONDENCE



SALT v. DACTYLUM

From the January issue of the Bulletin I learn that Mr. Stanley Middlebrook grows a lot of *Dactylum*.

May I tell you my way to overcome this disease? I had bad attacks and tried to control it in the usual manner by removing infected mushrooms and soil, spraying with formalin solution, drying out the beds and everything else described in the literature of mushroom diseases. But nothing helped until I tried to cover a spot of *Dactylum* with a thin layer of fine salt (NaCl) *without removing* any infected mushrooms or soil. The result was that in this spot the attack was stopped and the danger of contamination by the pickers' hands or otherwise eliminated.

Every morning before picking the salt box was started, all new spots covered and in about a month all the plants were approximately free from *Dactylum*. Since that time we have had a single spot now and then, but at once our good old salt box has stopped any further possibility of living and contamination.

Maybe Mr. Middlebrook should like to try this cure. I leave it gladly to him and to other growers of mushrooms who have troubles with *Dactylum*, and perhaps the salt method can be used against other diseases on the surface of the soil on account of its ability to destroy an infected spot without damage to the surrounding area.

KNUD REFFSTRUP (*Oslo*).



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Clelland, Wm. (Jnr.), Crag Cottage, Burnfoot, Kirkmuirhill, Lanark, Scotland.
Forsdike, L., Elm Nursery, Elm Drive, Lancing, Sussex.
Kark, Dr. Charles, 58 Lister Buildings, Jeppe Street, Johannesburg, South Africa.
Lisher, H., The Finches Nursery, Elm Grove, Lancing, Sussex.
Lower North Barn Nurseries Ltd., Old Salts Farm Road, Lancing, Sussex.
McBriar, R. J., Overdale, Sainfield, Belfast, N. Ireland.
Rayner, Commander D. A., Earlstone Manor, Burghclere, Newbury, Berks.
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INITIAL CAPITAL COST

Problems Before Starting to Build

When the decision to construct a mushroom plant has been made, and assuming that the prospective owner has already had experience in growing, the first important step is to decide which of the two systems, bed or tray, should be adopted. It matters little whether the experience in growing has been obtained from only one of these ways, as the hazards are similar, and provided the fundamental principles of growing are applied results will be satisfactory.

There may be a bias in favour of one or the other system and it would be as difficult to convert a "bed" man to trays as a Socialist to Toryism. An established grower would be unwise to change his methods in haste, but to the newcomer there are problems he must consider before his mind is made up.

In order to compare construction costs let us suppose that a target of 30,000 lb. per year has been set. A house of 36' \times 18' \times 8' would provide for 1,000 sq. ft. of beds giving a satisfactory air/bed ratio of 5 : 1. Two pounds per sq. ft. could be expected to be produced three times per year giving six thousand pounds per year, per house. Therefore five houses of this size would produce the output required.

A similar size of house would also allow for 1,600 sq. ft. of tray area and although there is a considerable reduction of air/bed ratio to 3½ : 1 it has been the writer's experience that 1½ lb. per sq. ft. per crop can be produced regularly in seven weeks giving five crops and 6½ lb. per sq. ft. per year. This gives an output of 10,000 lb. per house, three houses being required to produce the target of 30,000 lb. In addition, however, there would be a pasteurising chamber of approximately one half the size of a growing chamber.

There is, therefore, a saving of at least 20% in building costs alone if the tray system is adopted, and this saving is maintained in costing for insulating materials and heating plant.

The claim that the cost of trays is high is also mistaken. For the above 'bed' plant 580 cu. ft. of timber for the beds alone would be needed compared with 600 cu. ft. for trays. It is agreed that the manufacture of the trays is a considerable item but one must remember that a large amount of timber or other material will be needed to support the beds which will fairly balance the expense, especially if the trays are made up by one's own labour.

It is widely held that replacement costs are heavy, because trays last only a year or two. My experience suggests that, if they are handled reasonably, they do *not* fall to pieces. I have not had to replace one tray in eight successive crops. Minor repairs may have to be carried out, but they do not amount to very much.

A word of warning—the construction of a mushroom farm is a matter about which the building trade know very little. There are problems of insulation (especially regarding pasteurising chambers) which still baffle the manufacturers of insulating materials and even mushroom growers themselves cannot decide on the correct method of heating. Much helpful information can be obtained, however, and is well worth while collecting before plans are drawn up.

Comparison of crop production costs shows that there is very little difference between the two systems. It requires, on an average, ten tons of manure to fill a 'bed' house of 1,000 sq. ft. and the same quantity will fill a 'tray' house of 1,600 sq. ft. The cost of composting will, therefore, be the same. It is quicker to fill 1,600 sq. ft. of trays than a 1,000 sq. ft. of beds owing to the easier working conditions at the filling point and because the trays have only five inches of manure against eight on the beds. This advantage may be lost in spawning time owing to the greater area of the trays but, provided the job is well organised, it is certain that casing time would be very even in spite of the movement of trays from one room to another. It is well to remember that all filling, spawning and casing of trays is done at waist height—or below—whereas with beds the work is by no means so easy.

Maintenance of the crop i.e. watering, etc. should take longer on trays than on beds, because of the nature of stacking the trays, but picking is quicker as all this work can be done from the floor without the need for a ladder. Ladders are necessary if the trays are stacked high but this is a fault in plant design and cannot be counted against the system. Labour costs are, therefore, remarkably similar, and although more spawn and casing soil is used a very great saving in heating is made. Peak heating and spawn run is less costly owing to the small size of the pasteurising chamber, and the growing chamber has to be heated for only seven weeks per crop on trays instead of ten weeks on beds, the weight of mushrooms produced being the same in each case.

The conclusion must be, therefore, that although there is only a small advantage in crop production costs on trays there is a very definite gain in capital cost by employment of the tray system. Do not be deceived by tales of the fearful costs of mechanisation as a tray farm of 6,000 sq. ft. can be run efficiently and profitably with no more than a four-wheeled trolley. It would be useless, for instance, to purchase roller conveyors unless one's labour force is already large enough both to load and unload the conveyor at the same time. Even then it should only be installed if the alternative would be to employ more labour, for it is only to cut labour costs that machines are used.

Given a fixed sum of money, more mushrooms can be produced from it by means of the tray system than any other means, thus giving a greater return on initial outlay. It is the speed of production and not the size of the crop that is important, and *it is on the 'Woolworth' principle of small profits-quick returns that the tray system is supreme.*

CORRESPONDENCE

The MGA Bulletin is, most definitely, **worth the money**—and gets better each month.

R. FRASER.

MY WAY OF GROWING

10.—E. H. Jones, of Newland Products Ltd.

We are comparative newcomers to the industry, having started not yet four years ago and still groping our way towards efficiency.

The farm consists of three disused tunnels, spread over some two miles of track, with ancillary buildings built by us. The Services had the tunnels during the War for a dump and fitted them with doors, put in floors, installed electricity, and plastered them out where they leaked. We took over the lot on long lease at a microscopic cost, all in fair condition, with the exception of the electrical fittings, which had been looted.

Newland is our base. Here we have a concrete composting site, 50' × 4' (we could not have built it wider by reason of the fact that we have only the railway track on which to build) at the end of which is the heat room. This is a Handcraft hut, 36' × 18' × 9', of asbestos, lagged with glass wool, with a door at each end. Heating is by electricity, thermostatically controlled, with a load of 18 Kw.

At the other end of the heat room is the soil shed, a structure of poles and corrugated iron, with open sides, designed only to keep the soil dry. At the end of this there is the tunnel.

The tunnel is 300 yards long by 14 feet wide and 16 feet high, with ends of 3 feet brickwork, with double steel doors at one end and a single steel door at the other. A louvred ventilator is set in the brickwork at each end. This tunnel is comparatively dry, having been plastered throughout its length with a special water-resistant compound.

There is no heat in the tunnel, the temperature being 52° F., with no variation winter or summer. The Relative Humidity is high, being 90%. The other tunnels are some distance away and are similar in construction, the long one being 480 yards long and having floor beds, the shorter being 50 yards long and used for straw storage, etc.

We use long racing-stable manure, delivered in 12 ton lots. Our composting is by hand, although we intend to mechanise this shortly. A short-composting method is used, taking 10 days from stack to fill. Our method is stack and water; next day turn and water; turn three days later, adding 10 cwt. chicken manure and 3 cwt. gypsum; four days later, turn again; and fill! the next day. We endeavour to get as much water in as we can on the first stack and turn, but if the compost is at all dry we water again. The compost after 10 days is fully composted and fulfils all the usual shearing, etc. tests, but we like it rather wetter than is normal. On the tenth day it is filled into trays by hand. We have a plentiful supply of female casual labour for the job.

Our trays are small, being fruit juice boxes from the local cannery. We managed to buy 10,000 at a penny each at the beginning, and we have supplemented the wastage in these with peach and pear trays which we buy equally cheaply each season. These trays, being of thin wood, last one trip only and are then burnt.

Our compost fills approximately 200 square feet per ton; and a set of trays, filled from 12 tons of manure, numbers approximately 1,400.



can get 120° F. in 24 hours, some heat being lost through the doors.

After 24 hours at 120° we fumigate with BHC and parathion smokes and reseal with the heat switched off, for we find that the room will hold this temperature quite successfully. There is some tendency for the compost to dry out, even though we drape wet sacking over the heater bars and fill the compost rather wetter than is normal.

On completion of fumigation we open both doors and ventilators, cool to 70° F., and spawn. We use grain spawn exclusively, having tried manure spawn and found that under our conditions grain is more effective. We simply broadcast the spawn and ruffle it in with the fingers. It is not necessary to move any of the trays to do this. We spawn at the rate of 70 square foot of tray per carton. The spawn is run at 70° and after 14 days the trays are filled with mycelium and ready for casing.

The casing soil is overburden from a limestone quarry nearby, a sandy clay of pH 7, which is unfortunately very lumpy to handle under normal conditions. Trays are passed out of the heat room by roller conveyor, receiving an inch of soil as they pass through the soil shed. They are then loaded on to a low trailer and hauled by tractor into the tunnel, where they are stacked each side, two trays wide and four high the whole length, leaving a roadway through the middle.

Pinheads appear three to four weeks after casing and picking commences about 12 days later. Watering is necessary every 10 days. The tunnels being so vast, we have great difficulty in controlling weed fungi. Weekly we dust with a mixture of BHC and bisdithiocarbamate, the BHC being necessary by reason of the fact that although we have little trouble with Sciariids, we have a great population of Springtails in the floor of the tunnel. Of the fungi, we seem to have had a little of everything but nothing very serious. We have had small attacks of *Mycogone*, *Dactylium*, and *Verticillium*. Perhaps our growing temperature is the reason why we have not seen Truffle. Our chief worry is Bacterial Spot. We cannot do much about the high humidity of the tunnel so we dust with fungicide and ventilate well after watering.

After filling, the trays are moved into the heat room by roller conveyor and are stacked in "open brickwork" formation. This allows room for spawning without having to move the trays, access to the trays being by way of aisles between the stacks. When the heat room is full, it is sealed and the electricity is switched on.

In the coldest weather, we

We have no electricity in the tunnel, using in its absence (for light) the local miners' acetylene lamp which costs 10/- and burns a minute quantity of carbide per day.

A few points in conclusion. We have tried synthetic compost in many combinations, known and unknown, the best yielder being the MRA formula; but until the price of straw falls in this district, we must continue to use stable manure. We do not know how much we get per square foot but we do know how much we get per ton of manure, and if we get 200 lb. we are happy. This is over 12 weeks cropping and is probably equivalent to 1 lb. per square foot.

Our spent compost we have been able to sell, up to the present, at prices from 15/- to 30/- per ton in the heap, and we are steadily increasing the interest of local market gardeners in its use. In conclusion, we must emphasise the fact that we are Tray System supporters; with our set-up we could not be otherwise.



The Author is here seen with his partner, Mr. S. Barrett

Research Fund, 1953

The Directors of the Mushroom Research Association record with gratitude the following contributions to the 1953 Appeal Fund, whose target is £1,250. The response from abroad is particularly appreciated—especially the generous £38 6s. Od. from Messrs. Slack Brothers, of Canada.

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Bankers' Orders received each month as follows:—Snowcap Mushrooms Ltd. 16/8; Kildare Products £1; Hopping, C. H. Ltd. £1; Kilian, H. £1.50; Heather Farm £1.10.0; Turner, Col. W. A. 10/-; Ulm, J. 8/4; Davey, T. W. & Co. Ltd. 10/-; Leese, Sir Oliver £2.10.0; Elan Valley Products 10/-.

THE CULTIVATED MUSHROOM

7—CYTOLOGY

By ANDRÉ SARAZIN

In the foregoing account an attempt has been made to describe the development of the cultivated mushroom from the germination of the spores to the fruiting of the spawn by means of carpophores which in their turn produce new spores. It is now of interest to try to understand first of all more intimately its structural unit, namely the cell, as it passes through all its developmental stages. If the form of the cell varies from long and tubular in the mycelium to short and swollen in the carpophore where it appears finally in a specialized reproductive form (basidium), its morphological constituents remain appreciably the same.

Cell study, or cytology, requires the use of a powerful microscope and special techniques for examination (fixing, staining). It is outside the scope of this work to refer to them here and only the results which have so far come to light will be considered. For more ample information the reader might consult with advantage such important works as the *Traité de Cytologie Végétale*, by Guillermond, Mangenot and Plantefol (1933), and *La Cellule, Principes de Cytologie Générale et Végétale*, by Gautheret (1949).

The general plan of the cell of the cultivated mushroom is similar to that of all septate fungi. The following features may be observed in it:

On the outside, a thin membrane which in optical section looks like a framework delimiting the cells from neighbouring cells.

On the inside of this membrane, one or several very small globules slightly more refractile than the rest of the cell, the nucleus or the nuclei, distributed or grouped in the midst of a transparent colourless medium, the cytoplasm.

In the cytoplasm are:—1. Permanent bodies hardly more refringent than the cytoplasm itself, in the form of short rods or somites which are long and flexuous and which together constitute the chondriome. 2. Semi-fluid masses with curved outlines, the vacuoles, which together constitute the vacuome. 3. Very refringent lipid granules and various reserve inclusions (glycogen, protein crystalloids, etc.).

The cytoplasm, the chondriome and the various cytoplasmic inclusions will be considered first of all, then the cell wall, and finally the nucleus. Indeed, the nuclear cycle enables one to attempt to interpret that very important procedure—the developmental cycle of the cultivated mushroom which is linked to it and which will be discussed immediately afterwards.

1. The Cytoplasm and the Chondriome

The physical state of the living cell cytoplasm is that of a colloid; the living cytoplasm is transparent, but under the influence of heat or toxic substances it becomes coagulated and dies. It is in a state of

flux, and this fact is especially easy to demonstrate with a high magnification when observing a long mycelial tube (hypha) in which may be seen coursing along the cell wall the cytoplasmic currents which are detectable in the translocation of refringent particles. It is not possible to state positively that the cytoplasm circulates from one cell to another but it is certain that the cytoplasm of one cell is in contact with that of a neighbouring cell through a fine perforation in the cross-wall of the membrane which is called the plasmodesma. These features will be considered in connection with the membrane.

The chondriome, which is an assemblage of permanent cytoplasmic entities, is represented in the cultivated mushroom as granules or rods or flexuous threads which are more or less vesiculated. It is brought into prominence by special fixing and staining mitochondrial techniques. It is rather difficult to observe in living material. Guillermond (1913) was the first to describe these bodies in the cultivated mushroom. Under his masterly guidance I resumed the study of the chondriome during the various developmental stages of the cultivated mushroom (Sarazin, 1937).

In the small tubes which result from the germination of the spores the chondriome is made up of very short elements, granules or rods (Fig. 1). While the mycelial threads are lengthening, these elements remain short in the growing points but become progressively longer in the older parts to become long flexuous chondroconts which are more or less vesiculated (Fig. 2).



Fig. 1. Chondriome in germ-tube after fixation and staining. $\times 1,200$.

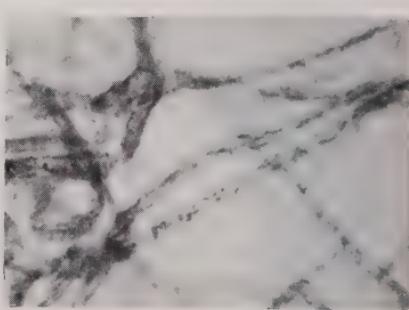


Fig. 2 Chondriome shown in mycelial threads after fixation and staining. $\times 1,100$.

The presence of a growing zone in the carpophore situated at the level of the gills between the stalk and the cap was mentioned in the chapter on Morphogenesis. If the development of the chondriome is followed from this zone of cell multiplication towards the lower regions of the stalk or towards the periphery of the cap, a particular alteration of the chondriome is observed. In the growing zone the chondriome is similar to that found normally in growing points, namely, a chondriome made up of short elements, granular mitochondria small rods and delicate vesicles (Fig. 3). In contradistinction, as the distance from this growing zone becomes longer and the distance from the relatively older parts, the peripheral zone of the cap and basal part of the stalk, becomes

shorter, a corresponding ageing of the chondriome elements takes place and they become transformed into increasingly longer elements which ultimately become flexuous and sometimes branched and more or less vesiculated (Fig. 4). This alteration is met with at all stages of the development of the carpophore, always excepting those matured carpophores in which the growing zone has ceased to be active and in which the chondriome everywhere appears the same.

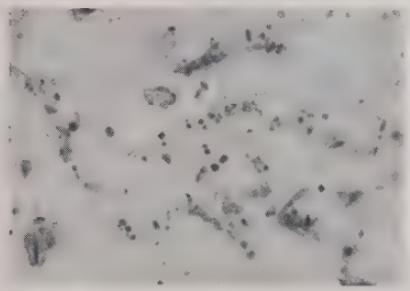


Fig. 3. Chondriome of growing zone composed chiefly of granular mitochondria, after fixation and staining. $\times 1,100$.

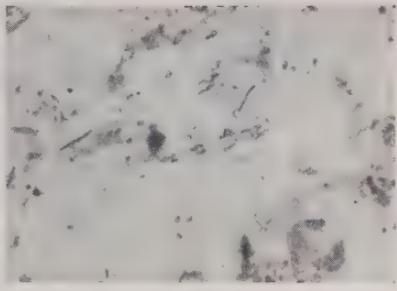


Fig. 4. Chondriome of the basal part of the stalk composed of more or less vesiculated long chondriocysts, after fixation and staining. $\times 1,100$.



Fig. 5. Chondriome of hymenium reaching maturity composed chiefly of mitochondria and chondriocysts, after fixation and staining. $\times 1,100$.

large proportion of these elements then migrates through the fine canal of the sterigma into the basidiospores and remains there in the form of granules and small rods (Fig. 6).

To recapitulate, an interesting feature of this development of the chondriome is the production, at certain stages, at the expense of the chondriome, of very numerous vesicles which are similar in all respects to those which form in the chondriocysts (amyloplasts) of the epidermal tissues and roots of phanerogams and which are determined by the presence of starch grains. It seems that these vesicles do not result from some alteration of the chondriosomes since they are detectable with all mitochondrial fixatives and appear only at given stages. Moreover, they are directly observable in living material under certain circumstances. The vesicles therefore would appear to result from a

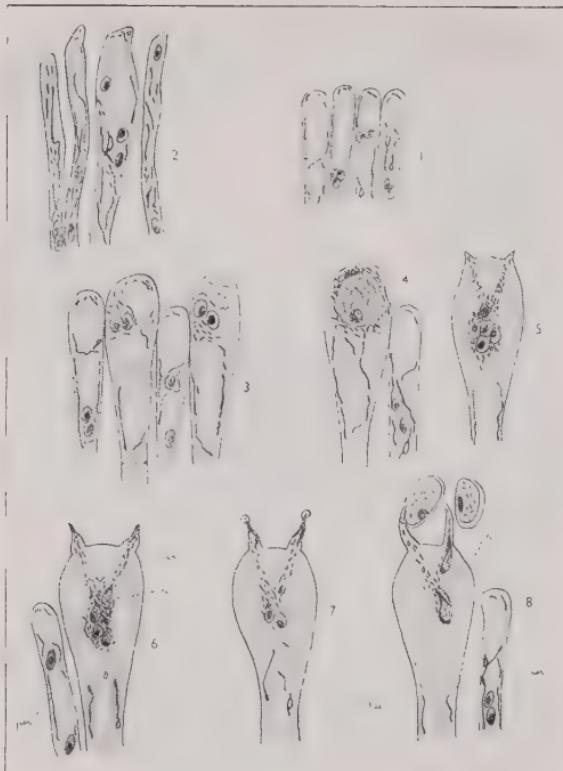


Fig. 6. Evolution of chondriome: bas. = basidium; par = paraphysis; n = nucleus; ch = chondriosomes. 1, 2: young hymenium, chondriocysts, mitochondria and vesicles. 3: Disappearance of vesicles. 4: Fragmentation of the chondriocysts into short rods which become massed together in the upper part of the basidium around the large nucleus resulting from caryogamy; 5: the chondriomes migrate towards the rudimentary sterigmata; 6: The nuclei resulting from meiosis migrate in their turn. 7: The first two nuclei lie within the sterigmata. 8: The first chondriosomes have penetrated the developing basidiospores.

metabolic activity peculiar to the chondriome, manifesting itself as a diffusible product the nature of which for this reason is not susceptible of interpretation. It has been possible to ascertain that these vesicles bear no direct relation to the glycogen which appears directly in the cytoplasm. While it has not been possible to establish the metabolic activity of the chondriome in the cultivated mushroom it has been demonstrated nevertheless in other basidiomycetes. In the red Phalloids, whether in regard to the stipe (*Mutinus*) or the receptacle (*Clathrus*), Panca Heim (1947) has attributed significance to the elaboration of a pigment carotene by the chondriocysts which have undergone a special transformation from granular mitochondria.

The difficulties attendant on the study of the chondriome do not allow one to assign a very definite rôle to these permanent elements of the cell; often it is a matter of hypothesis only. Nevertheless, it is possible in the light of recent work to state that the chondriosomes contain ferment which are chiefly those which control respiratory reactions. Again it may be hoped that, with the help of new techniques and methods of research (electron microscope, ultracentrifuge) which are increasingly available to the research worker, it will become established that these still enigmatic elements perform an indispensable rôle in the life of the cell.

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CREOSOTE AND ROSECOMB

Observations by Capt. G. P. LAWRENCE

In reading Mr. Middlebrook's Diary (entry 20th December) I wondered if he had ever seen a really hearty crop of Rosecomb, produced by the fumes of creosote on his own farm. I have on mine. I hope that he never will.

Bishops, of course, in great numbers, but worse, I think, much worse than that is an outcrop of something that resembles a miniature snow-capped Mont Blanc; and the strain on one's better self when one has to decide if the monstrosity can be concealed in the "roughs" or is too appalling even for that!

In my own unfortunate experience I dipped a quantity of board in a trough. At the time I was very satisfied that I was getting so much creosote into the board. I used two barrels—one creosote was much darker than the other. I shall always think it was the darker creosote that did the damage.

I rested this board, then used it without peak-heating; I had a few Bishops but no Mont Blancs.

Eventually I had the board planed, cut it up into box sets and steamed them. These boxes are now cropping normally, though the house smells to high heaven of creosote.

When I cut the board up I found that in many parts the creosote had penetrated completely. I believe that part of the answer may have been that it was an inferior lot of board of which a large proportion was sapwood, that it was seasoned to the extent that the sap had dried out of the sapwood, and that this sapwood was full of creosote. Peak heating produced the noxious fumes—and quite a lot of noxious fumes—because there was a lot of creosote there.

I think that if one creosotes a decent lot of timber, with little or no sapwood, very little creosote penetrates, but that it may be sufficient to deter dry-rot. During subsequent peak heats there is, in fact, so little creosote there that there are not enough fumes to cause any damage.

I am not claiming to have proved this theory, but I use no more creosote.

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4.—Mrs. F. M. Lawrence

How often does one hear people remark that such a large quantity of mushrooms are needed to satisfy a healthy appetite and that they are not a practical proposition in the difficult catering problems of to-day.

In what might be called the all-purpose recipe that follows, the object has been to show that, with a little ingenuity, a few ounces of mushrooms can provide a main meal.

Take $\frac{1}{4}$ lb. of mushrooms and cook them slowly in 2 oz. of dripping in a covered saucepan. One rasher of bacon cooked with them gives both richness and added flavour. When done, remove from the saucepan and chop them fairly finely. Add 2 oz. plain flour to the fat and cook for 2 minutes. Stir in a little milk to make a smooth sauce of the consistency of thick cream. Season with salt and pepper, put in the mushrooms and bacon, and bring to the boil.

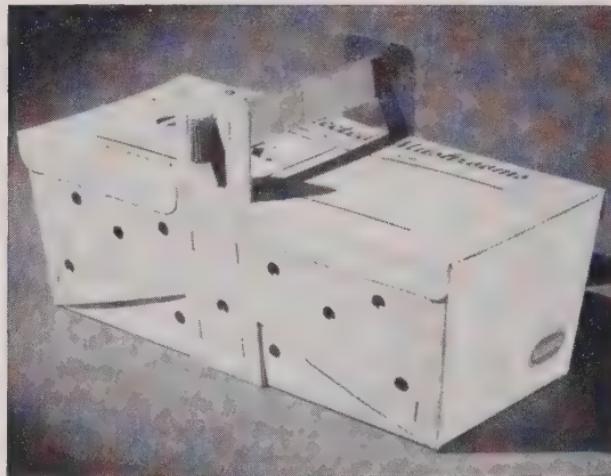
This mixture can be used in many ways.

1. Served as a sauce with grilled cutlets or fish.
2. Used for a filling for pancakes. You will find it will be quite enough for six pancakes.
3. It is the filling *par excellence* for an omelette.
4. On toast with a pinch of parsley in the centre.
5. Instead of the usual sausage roll, make a mushroom roll. The mixture will provide you with 12 small or six large rolls.
6. As filling for a large vol-au-vent, to cut in slices, or eight small ones, it makes a dish fit for a Queen, which gives us a Coronation flavour for 1953.

The last two recipes need rough puff pastry, made with $\frac{1}{2}$ lb. plain flour, 6 oz. fat and a little water. Divide the fat into three; crumble one-third into the flour and add water to make the dough. *Roll out and cover the dough with small pieces of one-third of the fat; fold up in four like an envelope and leave for 20 minutes. Repeat from * with the remaining third of the fat. Leave in a cold place for at least 12 hours; a refrigerator is the best place. This is most important.

To make the vol-au-vent, roll out the dough about half-an-inch thick, cut in one large round or eight small ones. Score small circles in the centre of each for the lid, and brush with egg. Bake in a hot oven until golden brown. Cut out the lid carefully and put in the mushroom filling, putting the lid on top.

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Stanley Middlebrook's Diary

Feb. 9. Further support for my ideas about spawns creating and requiring their own particular conditions. A Handcraft was filled with a rather wet compost; spawn "A" was used on the right side and "C" on the left. White Plaster Mould has developed heavily on the left but there is virtually none on the right, proving (a) that the compost was capable of that mould and (b) that spawn "A" can beat it and "C" can't. Interesting. We are thus getting a clearer picture of the use of spawns. If we have a wettish compost prone to various troubles or want quick growth and perhaps smaller mushrooms, we must use "A." If we want bigger mushrooms and a slower but longer crop, or if we have a dryish compost we must use "B" or "D." If we use "A" we must be prepared to fight Dactylium and with "B" we must expect Truffle. "A" may be a bit erratic but can frequently be remarkably productive. "B" and "D" are good stand-bys for average and reasonably safe cropping. "E" may have all the virtues—it's too early to tell yet. "C" we shall never use again. What is "E"? you ask. It's too early to tell yet! Anyhow we're learning our alphabet the hard way!

Feb. 12. I've had a shock. I hear my name has been coupled with Mr. Atkins' in some context. As if that isn't bad enough, I've been referred to as his *manager*—but whether over or under him I leave you to guess. I'm guessing myself, but I believe I know.

Feb. 17. Until every grower in the country is on trays and the quality and size of mushrooms available to the public has thereby universally deteriorated, something of a problem is being presented to those of us who use both methods. We at Brayton have often been troubled with small mushrooms even on shelves, but we never had the continuous complaints from the markets that have been our lot since we started with trays. It is difficult to decide how to distribute our shelf and tray samples among our markets. Maybe we're poor tray growers here—I don't know—but I submit we are not much below average. How many growers can claim a first-class quality from trays unless they've reduced their tray area per house or used deeper compost (which may mean the same thing) and thus sacrificed one of the main claims for the system?

Feb. 25. Ideally, short composting or the later stage of it anyway should be done in a completely closed shed, at any rate in winter. There is a 3' gap between the top of our outside walls and the roof, which allows a good deal of air and wind to enter, as well as allowing "steam" to escape. In winter winds and frosts, etc. have a bad effect on our small triangular stacks, particularly those towards the centre of the shed. These small stacks have a very meagre temperature tolerance and we feel we can blame the shed construction rather than our composting for some recent cropping reduction. We have been riddled with Dactylium, of course, but without doubt winter short composting is not free from blame.



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Mar. 1. The "Seen this?" feature of the last Bulletin amused me highly. The inference of the item was that the rose-spray with trigger control was something new. Dash it, I pioneered this idea 12 or 13 years ago with a Haws rose and another maker's trigger and have used the same adaptation ever since. (Peace, peace, Mr. Orritt! —I apologise in advance in case you pioneered it before me!)

Mar. 2. It is high time the truth were driven deep into the parsimonious minds of some chefs and caterers that mushroom soup should have a flavour of mushrooms and a mushroom sauce should be something more than flour and water. No wonder one is often hearing the complaint "Mushrooms are tasteless things," when the "taste" is never properly introduced. How different is a soup I've just sampled, made by a Swedish grower/canner. Full mushroom flavour and no doubt about it, far exceeding anything by any other canner in my experience. It looked, smelled and tasted like mushroom soup. It was the best ever. It was so good and so richly flavoured with the genuine article, so many mushrooms must have been used to achieve this high concentration, that I wonder how ever canning can pay when compared with "selling fresh."

Mar. 4. I understand Mr. Luxmoore dashed off his disrespectful poem (last Bulletin) in a matter of moments. I envy his ease of—er—invention. It will take me weeks to rhyme a reply. Disrespect? Yes, I think so, though I'm keeping an open mind until I hear from his own lips exactly what the poem was about. But his expression "Pepys mycological" was nothing short of literary genius.

Mar. 7. I think perhaps our biggest cost problem to-day is heating. With the ever-increasing price of coal and coke we are forced to examine every possible means of reducing consumption. Those who are contemplating building a new farm have not such a big problem as they have the choice of several methods available, but the established grower cannot easily effect any serious economy. To tear out the whole system at this time of falling mushroom prices and replace with a different layout would be too much of a drain on our dwindled resources. The only economies I can see are a closer watch on the daily performance of the boilers, better insulation, and reduction of winter ventilation. The first two would help but the last would, I think, be false economy.

Mar. 9. As the speakers at the Refresher Course on the 16th include no suitable person at whom you may throw your bad oranges and diseased mushrooms, someone has decided to push me in to provide a target. In order to encourage the sport I have been told to give my views on the Tray System. So they think they're calling my bluff, do they? Have they never heard of a boomerang?

Mar. 11. I have been quite concerned lately about the ever-growing pile, now assuming mountainous proportions, of "don't-know-how-to-reply" letters on my desk. I've called in several experts for advice and their suggestions range from "Burn the lot!" to "The bottom ones will have answered themselves by now and the rest soon will, don't worry." But the best proposition came from a mushroom grower who as soon as he saw the agglomeration said "Isn't it time you started trashing, Old Boy?"

—CRAVEN—

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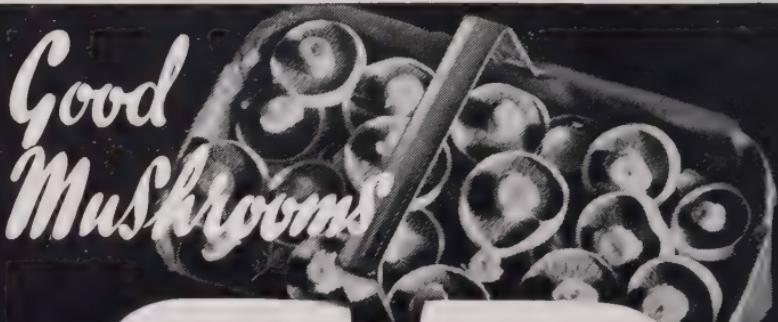
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